

AMENDMENTS TO THE CLAIMS

1. **(Currently Amended)** A computer program product having program code which program code is stored on a computer-readable storage medium and which, when executed on a processor is adapted to provide, upon execution, a database of information objects and a database engine for managing said objects, **characterized** in that

each information object comprises metadata for describing the information object and for defining a hierarchical structure of branches which constitutes said information object and which includes relations to other information objects,

wherein an individual branch has:

a metadata type, which is selected from a predetermined and limited set of n different metadata types and which represents one respective hierarchical level in said hierarchical structure;

a metadata value; and

an arbitrary number of other branches, of any hierarchical level strictly subordinate to the hierarchical level of said individual branch, connected to said individual branch as children thereof, said arbitrary number including zero branches;

said branch table having columns that correspond to the n different metadata types and each information object is stored in said database in the form of an n -field data structure is stored as a row in said branch table; and

a query function for searching said database, wherein said query function is adapted to:

accept a search query which is specified in a declarative language in accordance with said hierarchical structure of information objects in said database and which thus defines a branch hierarchy to search for;

search said database so as to find information objects, if any, which contain a branch hierarchy that makes the one specified in said declarative language; and further adapted to comprise the steps of:

a) receiving a search query;

b) transforming the search query into a search hierarchy of row searches

and joins by:

b1) generating a top join for joining all results at metatype Object;

b2) traversing the branches of the search query top-down by

b'1) if a particular branch has no children, creating a row search with the metadata values of all branches from the root down to the particular branch as conditions on metadata values in the row search;

b'2) if a particular branch has more than one child, creating a join for joining row searches and joins at the metatype of the particular branch;

b'3) adding a row search created in step b'1) or a join created in step b'2), respectively, as a child of a preceding join;

c) performing all the row searches from step b) so as to result in a set of rows in the branch table;

d) performing the joins in a search hierarchy successfully starting from the bottom of the search hierarchy and ending with the top of the search hierarchy;
and

e) producing a result of the search query by retrieving all unique objects from the outcome of step d).

2. **(Currently Amended)** A computer program product as in claim 1, wherein each information object is stored in said database in the form of an n -field data structure for each particular branch that does not have any children, and wherein each field of the n -field data structure represents a respective branch that ~~preceeds~~ precedes said particular branch as its ancestor.

3-4 Cancelled.

5. **(Currently Amended)** A computer program product as in claim 4~~1~~, wherein said declarative language is xml.

6-7. Cancelled.

8. **(Currently Amended)** A computer program product as in ~~any preceding~~ claim 1 or 2, wherein said metadata includes metadata attributes to respective branches of an information object.

9. **(Currently Amended)** A computer program product as in claim 4~~and~~8, wherein said query function is adapted to accept search queries with constraint conditions on said metadata attributes.

10. **(Currently Amended)** A computer program product as in claim 9, wherein said metadata attributes include timestamps on individual branches of an information object.

11. **(Currently Amended)** A computer program product as in claim 9, wherein said metadata attributes include access rights to individual branches of an information object.

12. **(Currently Amended)** A computer program product as in claim 9, wherein said metadata attributes include unit definitions for individual branches of an information object.

13. **(Currently Amended)** A computer program product as in claim 4 1, wherein a branch of a predetermined first metadata type in an individual information object defines a relation from said individual information object to another information object and wherein said query function is adapted to search said database to find said another information object by matching the metadata thereof with the metadata included in said branch of a predetermined first metadata type value in said individual information object.

14. **(Currently Amended)** A computer program product as in claim 13, wherein a branch of a predetermined second metadata type, other than said first metadata type, in an individual information object allows another information object to define a reverse relation to said individual information object, in the form of a branch of said predetermined first metadata type in said another information object, and wherein said query function is adapted to find said another information object by matching the metadata included in said branch of a predetermined second metadata type in said individual information object with the metadata included in said branch of a predetermined first metadata type in said another information object.

15. **(Currently Amended)** A computer program product as in claim 6, ~~13 and~~ 14, wherein ~~$n = 6$~~ and said set of metadata types consists of {Object, Relation, Key, Attribute, Type, and Value}, metadata type Object representing the root level of said hierarchical structuresaid first metadata type is Relation and said second metadata type is Key.

16. **(Currently Amended)** A method of searching a database of information objects as provided by the computer program product according to ~~any of claims 1-15~~ or 2, **characterized** by the steps of

specifying, through a man-machine interface of a computer (930), a search query in a declarative language in accordance with said hierarchical structure of information objects in said database;

submitting said search query to said database engine through said computer;

receiving a result of said search query at said computer; and

presenting said result through said man-machine interface.

17. **(Withdrawn-Currently Amended)** A method of exporting data from at least one arbitrary database, **characterized** by

identifying a first plurality of relations between different pieces of data in said at least one database;

defining a second plurality of information objects, each of said information objects comprising metadata which represents individual ones of said first plurality of relations and said different pieces of data, said metadata being of n different metadata types, n being a predetermined integer;

for each information object, forming an n -level hierarchical information structure, where each metadata type is represented at a respective unique level; and

storing the information structures thus formed for said second plurality of information objects.

18. **(Withdrawn)** A method as in claim 17, where said information structures are stored in at least one flat file on a long-time data storage medium, including but limited to a magnetic disk, an optical disk, a magneto-optical disk or an electronic semiconductor memory.

19. **(Withdrawn-Currently Amended)** A method as in claim 17 ~~or 18~~, where said information structures are expressed in a text format of a declarative language.

20. **(Withdrawn)** A method as in claim 19, wherein said declarative language is xml.

21. **(Currently Amended)** A method of connecting objects in a database of information objects as provided by the computer program product according to ~~any of~~ claims 1-15 or 2,

characterized by the steps, for an assumed individual information object, of

for all branches in the assumed information object that are of a first predetermined metadata type, said first predetermined metadata type allowing a relation to be defined from the assumed information object to another information object:

forming a query based on the metadata of the branch,

searching the database with the query, and

collecting, as a result of the searching step, all information objects, if any, that the assumed information object has a relation to; and

for all branches in the assumed information object that are of a second predetermined metadata type, other than said first predetermined metadata type, said second predetermined metadata type allowing a reverse relation to be defined from another information object to the assumed information object:

forming a query based on the metadata of the branch,

searching the database with the query, and

collecting, as a result of the searching step, all information objects, if any, that have a relation to the assumed information object.

22. **(New)** A computer program product having program code, which program code is stored on a computer-readable storage medium and which, when executed on a processor is adapted to provide a database of information objects and a database engine for managing said information objects, characterized in that

- each information object comprises metadata for describing the information object and for defining a hierarchical structure of branches which constitutes said information object and which includes relations to other information objects,

wherein an individual branch has:

- a metadata type, which is selected from a predetermined and limited set of n different metadata types and which represents one respective hierarchical level in said hierarchical structure;
- a metadata value; and

- an arbitrary number of other branches, of any hierarchical level strictly subordinate to the hierarchical level of said individual branch, connected to said individual branch as children thereof, said arbitrary number including zero branches,

wherein the computer program product is further adapted to:

- a) receiving a search query;
- b) transforming the search query into a search hierarchy of row searches and joins by
 - b1) generating a top join for joining all results at metatype Object;
 - b2) traversing the branches of the search query topdown by
 - b'1) if a particular branch has no children, creating a row search with the metadata values of all branches from the root down to the particular branch as conditions on metadata values in the row search;
 - b'2) if a particular branch has more than one child, creating a join for joining row searches and joins at the metatype of the particular branch;
 - b'3) adding a row search created in step b'1) or a join created in step b'2), respectively, as a child of a preceding join;
- c) performing all the row searches from step b) so as to result in a set of rows in a branch table;
- d) performing the joins in the search hierarchy successively starting from the bottom of the search hierarchy and ending with the top of the search hierarchy; and
- e) producing a result of the search query by retrieving all unique information objects from the outcome of step d).

23. (New) A computer program product having program code, which program code is stored on a computer-readable storage medium and which, when executed on a processor is adapted to provide a database of information objects and a database engine for managing said information objects, characterized in that

- each information object comprises metadata for describing the information object and for defining a hierarchical structure of branches which constitutes said information object and which includes relations to other information objects,

wherein an individual branch has:

- a metadata type, which is selected from a predetermined and limited set of n different metadata types and which represents one respective hierarchical level in said hierarchical structure;
- a metadata value; and
- an arbitrary number of other branches, of any hierarchical level strictly subordinate to the hierarchical level of said individual branch, connected to said individual branch as children thereof, said arbitrary number including zero branches,

wherein the computer program product is further adapted to:

- a) receiving a search query;
- b) transforming the search query into a search hierarchy of row searches and joins by
 - b1) generating a top join for joining all results at metatype Object;
 - b2) traversing the branches of the search query topdown by performing row searches;
- c) performing all the row searches from step b) so as to result in a set of rows in a branch table;
- d) performing the joins in the search hierarchy successively starting from the bottom of the search hierarchy and ending with the top of the search hierarchy; and
- e) producing a result of the search query by retrieving all unique information objects from the outcome of step d).

24. (New) A computer program product as in claim 23, wherein said row searches comprises at least, if a particular branch has no children, creating a row search with the metadata values of all branches from the root down to the particular branch as conditions on metadata values in the row search.

25. (New) A computer program product having program code, which program code is stored on a computer-readable storage medium and which, when executed on a processor is adapted to provide a database of information objects and a database engine for managing said information objects, characterized in that

- each information object comprises metadata for describing the information object and for defining a hierarchical structure of branches which constitutes said information object and which includes relations to other information objects,

wherein an individual branch has:

- a metadata type, which is selected from a predetermined and limited set of n different metadata types and which represents one respective hierarchical level in said hierarchical structure;
- a metadata value; and
- an arbitrary number of other branches, of any hierarchical level strictly subordinate to the hierarchical level of said individual branch, connected to said individual branch as children thereof, said arbitrary number including zero branches,

wherein the computer program product is further adapted to:

- a) receiving a search query;
- b) transforming the search query into a search hierarchy of searches and joins by
 - b1) generating a top join for joining all results at metatype Object;
 - b2) traversing the branches of the search query topdown by performing searches, wherein said searches comprises, if a particular branch has no children, creating a search with the metadata values of all branches from the root down to the particular branch as conditions on metadata values of information objects in branches of the search;
- c) performing all the searches from step b);
- d) performing the joins in the search hierarchy successively starting from the bottom of the search hierarchy and ending with the top of the search hierarchy; and
- e) producing a result of the search query by retrieving all unique information objects from the outcome of step d).